

## Getting the Drift

### Methyl Bromide Application and Adverse Birth Outcomes in an Agricultural Area

Although occupational exposures to the pesticide methyl bromide are associated with numerous health problems,<sup>1</sup> little is known about the potential effects to the general population of chronic low-level exposure. However, agricultural drift has been associated with prostate cancer in one study of adult males,<sup>2</sup> and a handful of animal studies have suggested potential developmental toxicity, including reduced birth weight.<sup>3</sup> A new study in *EHP* based on modeled methyl bromide exposure in a human population now reports associations consistent with experimental findings.<sup>4</sup>

Some uses of methyl bromide were phased out in 2005 under the Montreal Protocol on Substances that Deplete the Ozone Layer.<sup>5</sup> However, the protocol permits several continued agricultural applications, or “critical uses,” due to a lack of technically and economically viable alternatives.<sup>6</sup> One reason methyl bromide is so difficult to replace is that none of the alternatives have such broad activity at a cost growers can afford. There has been some research on combining other compounds, but so far there aren’t any cost-effective options that work as well.<sup>7</sup> More than 1.75 million kg of the pesticide was applied in California in 2010.<sup>8</sup>

“Before we even started our research, we looked to see what was already known about this chemical, which is such an important pesticide in California agriculture,” says Kim Harley, study coauthor and associate director for health effects research at the Center for Environmental Research and Children’s Health, University of California, Berkeley. “There was very limited evidence for reproductive and developmental toxicity; there was almost nothing.” To learn more, Harley and her colleagues drew on data collected through the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) Study. This longitudinal cohort study began in 1999–2000 with the enrollment of 601 pregnant women living in the Salinas Valley, an agricultural area in Northern California, and was designed to assess children’s exposure to pesticides and other chemicals and potential related effects.

The researchers paired CHAMACOS Study data for a subset of 442 women with information from California’s Pesticide Use Reporting system, which logs detailed information about the timing, location, and amount of pesticide applications. Interviews with the women at baseline

and during the course of their pregnancies provided demographic and health information. The Global Positioning System coordinates of their homes were meshed with data from the Pesticide Use Reporting system to reveal methyl bromide amounts applied within 1, 3, 5, and 8 km of each residence. Medical records included pregnancy duration and newborns’ length, weight, and head circumference.

The primary analysis focused on methyl bromide use within 5 km of a residence during each trimester of pregnancy. During the second trimester—a critical period of fetal growth—there were estimated decreases in average birth weight, length, and head circumference of 21.4 g, 0.16 cm, and 0.08 cm, respectively, for each 10-fold increase in methyl bromide use within 5 km.

Clinically, the estimated changes would be considered insignificant; however, the association suggests a downward shift in the overall distribution of growth variables with exposure during the second trimester. More highly exposed women had babies estimated to average 113.1 g (about 4 oz) lighter than those of unexposed mothers. By comparison, Harley says, smokers have babies that are about 150–250 g lighter than nonsmokers, “so this is not a trivial difference in birth weight that we’re seeing in the high-exposed groups versus the unexposed group.”

“The data are interesting,” says Lygia Budnik, a professor in the Division of Occupational Toxicology and Immunology, Institute for Occupational and Maritime Medicine, University Hospital Hamburg-Eppendorf, Germany. “The critical-use exemption aspect is very important.” Budnik emphasizes that in addition to use in agriculture, other uses of methyl bromide are still permitted, such as fumigation of freight containers. “We believe that more people are or were exposed than has been [reported], and many people might not be aware of the exposure and the resulting health problems,” she says.

The study’s strengths included detailed information about the women and their babies and about methyl bromide use near their homes. However, effects of other pesticides, especially chloropicrin, which is often combined with methyl bromide, could not be ruled out. Additionally, individuals’ actual exposure could not be assessed.

“That’s what’s really hard about methyl bromide—we don’t have a biomarker,” says Harley. Residential proximity to application sites provides a good estimate of exposure, but it only applies to exposure at home; exposure levels away from home are unknown. Budnik and her colleagues are currently working on a potential biomarker based on increased blood levels of mitochondrial DNA in individuals exposed to methyl bromide and other fumigants.<sup>9</sup>

**Julia R. Barrett**, MS, ELS, a Madison, WI-based science writer and editor, has written for *EHP* since 1996. She is a member of the National Association of Science Writers and the Board of Editors in the Life Sciences.

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**A strawberry field outside Salinas, California. Strawberries are one of several crops for which methyl bromide may still be used.**

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### **Erratum: “Getting the Drift: Methyl Bromide Application and Adverse Birth Outcomes in an Agricultural Area”**

In the June 2013 News article “Getting the Drift: Methyl Bromide Application and Adverse Birth Outcomes in an Agricultural Area” [[Environ Health Perspect 121:A198 \(2013\)](#)], Lygia Budnik was identified as an assistant professor when she is, in fact, a full professor. *EHP* regrets the error.